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Risk- Return and Volatility analysis of Sustainability Indices of S&P BSE

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Abstract

BSE being a responsible stock exchange has taken the initiative by screening the Indian companies on the basis of their environment and social performance and same is grouped under Sustainability Indices category. This study examines empirically the volatility between risk (conditional volatility) and returns for the BSE Sustainability Indices over the period of January 2011 to March 2016. Augmented Dickey–Fuller test was conducted to note the stationarity of the data and also tested the Generalized Autoregressive Conditional Heteroscedasticity (GARCH) in mean methodology to analyse the volatility. Results show that index returns are stationary and there is no GARCH affect for both index returns.

Keywords: *GREENEX, CARBONEX, Sustainability, Volatility, Sustainability Investment and Risk-return Tradeoff*

JEL Classification: C58, D53, G1

1.1 Introduction

Companies have started to publish exclusive reports on their sustainability practices to disclose their concern towards environment, social and governance (ESG). Companies have additional mileage in attracting the special class of investors who pursue to exhibit their behavior and interest (Jansson, M., & Biel, A, 2014). Even individual investors match their values and regular practices with companies' practice and invest in those sustainable companies. Healthier social performance develops employee morale and company status in the financial system both at national and global level. Sustainable investment helps in developing a diversified portfolio as it considers the several factors. Diversifying investment helps in reduce volatility (Hoti et al. 2005)

India being one of the investors favorite destination, Indian companies are reviewed under several parameters. Since, screening of the companies on ESG parameters have become global bench mark both at individual and institutional level. These categories of investors would prefer their money to be invested in those companies whose practices are aligned with sustainability standards. Though these investors show their concern towards sustainability, they do expect a good return as their objective is to satisfy their both financial and non-financial goals.

BSE stock exchange has made easy for responsible investors to identify sustainable companies as they are grouped under the Sustainability indices head. At the same time investors are keen to know whether financial performance, volatility and returns are positive or negative. It is also equally important to know whether these indices are riskier and have the risk and return relationship.

Uncertainty, or risk, plays an important role in financial analysis and is usually measured with volatility. Obviously, the volatility of an asset is not observable so its modeling is necessary. Based on a constructed model, the volatility can be measured as well as be predicted. The prediction of volatility is crucial for option pricing and risk management (estimation for value-at-risk). In literature, numerous volatility models have been suggested to capture the characteristics of return for an asset.

1.2 Objective of the study

Variation in the daily prices of the securities is one of the results of the financial data as it carries the nature of stochastic. Expected or Normal variation in stock prices may not have much impact on investors investment decisions if price thumps are too sharp it makes investment decision difficult. Hence, the objective of this research paper is to measure the volatility of two sustainable indices of S&P BSE India.

1.3 Data Source and Research Methods

The study is based on the secondary data that were collected from BSE website. The daily closing prices of Greenex and Carbonex indices over the period from January 2011 to March 2016 were collected and used for analysis. Statistical tools viz. Descriptive Statistics, ADF and GARCH were applied and analysed using E-Views 8 Econometrics package. Volatility has been estimated on return (r_t) and hence before going for all these tests, first the daily returns were calculated. The Indices return series are calculated as a log of first difference of daily closing price, which is as follows

$$\mathbf{r_t = \log(P_t / P_{t-1})}$$

where r_t is the logarithmic daily return of both indices for time t, Pt is the closing price at time t, and Pt−1 is the corresponding price in the period at time t − 1.

1.4 Results and Discussion

Descriptive Statistics, ADF test and GARCH techniques are used to analyse the returns of indices.

Table 1 Descriptive Statistics

Description	GREENEX	CARBONEX
Mean	0.007735	0.007576
Maximum	1.909817	1.545264
Std. Dev.	0.464681	0.459137
Skewness	-0.131828	-0.239320
Kurtosis	4.409821	4.601810
Jarque-Bera	111.4267	151.3899
Observations	1300	1300
P-Value	0.00000	0.00000

Source: Author Compiled

Table 1 depicts the summary statistics of two indices. The mean returns of both indices are positive. Standard Devaluation value of Greenex and Carbonex are 0.464681 and 0.459137, this indicates that Carbonex returns are positioned closely to its mean compared to Greenex. The return series of both indices are negatively skewed (-0.131828) and (-0.239320) indicating that the distribution is non-symmetric and mean is less than the mode. Since Kurtosis values are greater than 3 (k > 3) underlying data are leptokurtic, tails are longer and fatter, and often its central peak is higher and sharper and which is again confirmed by Jarque -Bera test statistics, which is significant at 1% and hence the null hypothesis of normality is rejected.

1.4.1 Unit Root Test

Financial time series has to fulfill the condition of stationarity before the study proceed to application of volatility models. ADF (Augmented Dickey–Fuller test) test is employed to test the stationarity of the data. And result is presented below:

Table -2: Showing Stationarity of the Data Series

Value	Carbonex	Greenex
ADF-Statistic	-32.70657	-32.39734
Prob	0.0000	0.0000
Test critical values:		
1% level	-3.435173	-3.435173
5% level	-2.863557	-2.863557
10% level	-2.567894	-2.567894

Source: Author Compiled

H0 = Log returns have unit root or time series is nonstationary
H1 = Log returns are not have unit root or time series is stationary

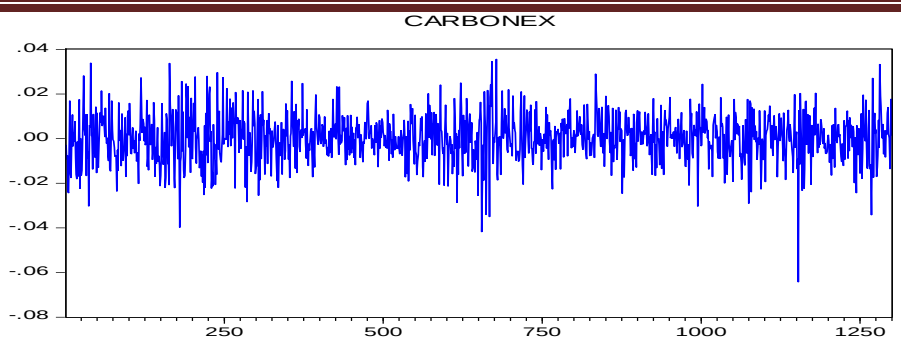
Table 2 shows the presence of unit root in the series tested using ADF. The *p* values for both indices are < 0.05, which lead to conclude that the data of the time series for the entire study period is stationary which means reject the null hypothesis and accept the alternative hypothesis.

The ADF test statistics reported in table 2 reject the hypothesis at 1% level with the critical value of –3.43 for ADF test of a unit root in the return series. Hence, the results of both the tests confirm that the series are stationary.

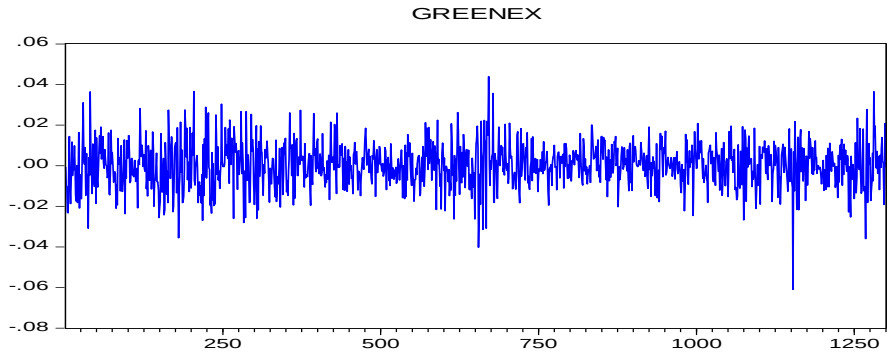
1.4.2 Measuring Volatility

Index fluctuation can be measured both graphically and mathematically. This section studies the index volatility under graphical method.

As per the graph, the degree of volatility is less as the movement of returns not fluctuated either on the upper side or lower side. Series are clustered both in short term as well as long term except in the few cases where spikes moved downwards.



Graph.1: Carbonex returns



Graph.2: Greenex returns

1.4.3 GARCH Model

The risk-return trade-off is studied with the help of GARCH in the mean model (GARCH-M model). This model allows volatility to enter in the mean equation as an explanatory variable. The estimates from this model are used to examine whether the risk is related significantly to return or not. The results of GARCH-M model estimation on CARBONEX and GREENEX returns series are portrayed in the following tables.

H0: There is no GARCH effect

H1: There is a GARCH effect

GARCH-M CARBONEX

Dependent Variable: CARBONEX				
Method: ML - ARCH (Marquardt) - Normal distribution				
Sample: 1 1300				
Included observations: 1300				
GARCH = C(3) + C(4)*RESID(-1)^2 + C(5)*GARCH(-1)				
Variable	Coefficient	Std. Error	z-Statistic	Prob.
GARCH	13.05075	8.259861	1.580021	0.1141
C	-0.000973	0.000884	-1.100865	0.2710
	Variance Equation			
C	3.29E-06	1.14E-06	2.891490	0.0038
RESID(-1)^2	0.051559	0.013205	3.904565	0.0001
GARCH(-1)	0.918847	0.020776	44.22704	0.0000

The coefficient of variance in the equation is positive (i.e. 13.05075) and statistically insignificant as the p-value exceeds the 0.05. This means result can reject the alternate hypothesis and accept the null hypothesis there is no GARCH effect and also indicates the absence of a significant risk-return relationship.

GARCH M - GREENEX

Dependent Variable: GREENEX				
Method: ML - ARCH (Marquardt) - Normal distribution				
Sample: 1 1300				
Included observations: 1300				
GARCH = C(3) + C(4)*RESID(-1)^2 + C(5)*GARCH(-1)				
Variable	Coefficient	Std. Error	z-Statistic	Prob.
GARCH	10.78857	7.100999	1.519303	0.1287
C	-0.000743	0.000764	-0.972314	0.3309
	Variance Equation			
C	2.56E-06	9.54E-07	2.681404	0.0073
RESID(-1)^2	0.057122	0.013787	4.143209	0.0000
GARCH(-1)	0.920929	0.018960	48.57283	0.0000

The coefficient of variance in the equation is positive (i.e. 7.100999) and statistically insignificant as the p-value exceeds the 0.05. This means result can reject the alternate hypothesis and accept the null hypothesis there is no GARCH effect and also indicates the absence of a significant risk-return relationship.

Conclusion

Sustainability Indices are young indices of BSE and started getting the attention of investors. As it has a long way to go to attract more investors. The risk-return trade-off and volatility behaviour of sustainability indices of BSE were studied with the help of Descriptive Statistics, ADF test and GARCH M models. This paper examines empirically the volatility between risk (conditional volatility) and returns for the BSE Sustainability Indices. Results show that both indices returns are stationary and there is no evidence of a significant risk-return relationship in BSE CARBONEX and BSE GREENEX return series. The findings of the present study may help the investors in exploring the risk exposure of their investment in India banking sector. They may use these findings in framing their investment strategy to manage their portfolio risk in a better way.

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